POST-PROJECT MONITORING REPORT
ON
RESEARCH PROJECT BY-PRODUCTS (BALI)

By A Monitoring Team
UDAYANA UNIVERSITY

79.

Post-Project Monitoring Report on Research Project By - Products (Bali)

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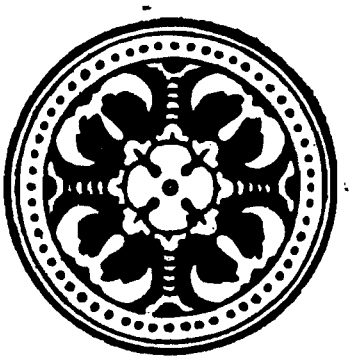

By

A Monitoring Team

UDAYANA UNIVERSITY

Faculty of Animal Husbandry

Department of Nutrition and Tropical Forage Science

Denpasar

Bali

Indonesia

1985

C O N T E N T

Member of the monitoring team

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A B S T R A C T

A post-project monitoring study has been carried out on the research project By-products (Bali) to assess the utilization of its research output and its contribution to the indigenous research capacity in Bali.

The By-products (Bali) has made some contributions on the science and technology in the field of roughage and concentrate feeds and feeding to Bali cattle raised in confinement. Such research feedings not only have some scientific and practical applications but also showing some social and economic benefits to the farmers.

Policy maker, excecutive and extension officers play an important role on the implementation of the research results.

I. INTRODUCTION

Bali is an island of 5620 km^2, consisted of 17% rice field, 27% dryland farming area, 21% plantation and the rest is forest and critical land (Anon 1980). The annual rainfal which is varies from 900 - 3000 m, fall mainly during the November to March rainy season. The soil generally consists of regosol, latosol and mediteran types (Winaya et al. 1980).

Of the 2.5 million people, 60 - 70 % are farmers and most, if not all of them practise mixed farming with livestock, particularly cattle, always integrated in the farming system. In this small holder wetland farming system, the income from livestock represent 10 - 15% of the farm income, whereas in the small holder dryland farming system the income from livestock represent 29 - 43% of net farm income (Putra and Arga 1979).

There are about 380,000 head of Bali cattle in Bali, with export quota of 25,000 head/year. The trend in the cattle population is positively encouraging ($\pm$ 4.81%) (Nitis et al. 1980).

Based on the present consumption pattern, Bali has a surplus of 2.8 million tonnes of roughage, 15,000 tonnes of copra meal and 40,000 tonnes of rice bran (DM basis) annually (Nitis et al. 1980).

In the traditional small holder farming system in Bali, ruminants are mainly fed roughage, whereas concentrate supplement is not generally practised. Concentrate, from agro-industrial by-products are mainly for non-ruminants.

Since thre is a surplus of roughage and agro-industrial by-products, research project designated as "By-products (Bali)"had been carried out for 7 years to study the effect of replacing 30% of the green roughage with concentrate on the performanceof Bali cattle. This research project is financed by IDRC, with LIPI as counterpart agency and Udayana University as the executing agency.

This report described the result of the post project monitoring study on the research project By-products (Bali).

II. BRIEF DESCRIPTION OF THE RESEARCH PROJECT BY-PRODUCTS (BALI)

Details of the By-products (Bali) has been described in the final report (Nitis and Lana 1984). In this report only some of the pertinent points are presented.

2.1. Location

The research project was carried out at Petang village, 31 km from Denpasar, of 450 m elevation. It is in the border of the rice field and dryland farming area and a buffer zone between the Pelaga rural community in the north and Denpasar urban/metropolitan community in the south of Badung regency.

In the Master plan of Bali province, Petang district is one of the livestock fattening area in Bali.

2.2. Hypothesis

Under traditionalfarming practices, Bali cattle fed entirely on green roughage of low nutritive value, grow slowly. Supplementation of concentrate from agro-industrial by-product not only increase the production and quality of the cattle, but also increase the income of the farmers.

2.3. Objectives

The objectives are :

1) To study the performance (growth rate, fed efficiency and carcass quality) of Bali cattle fed grass supplemented with various concentrate mixture, time of supplementation and role of concentrate as energy or protein supplement.
2) To determine the chemical composition of grass, shrub and tree leaves commonly fed to livestock in Bali
3) To determine the most economical concentrate supplement.

2.4. Feeding Trial

The feeds consisted of 70% natural grass and 30% concentrate mixture. The concentrate consisted either solely or combination of copra meal, rice bran, cassava chips and/or poultry manure. The trial is terminated when the average live weight of the cattle in each treatment reach 375 kg (market weight).

The result showed that Bali cattle fed natural grass supplemented with concentrate mixture gained 55 - 128% more weight than those without concentrate supplement. Quality of the concentrate mixture and strategic concentrate supplement played on important role in accellerating the live weight gain.

2.5. Feeds

Botanical composition of the roughage fed to cattle in the project and outside the project were determined every 28 days. Chemical composition of the roughage determined weekly, montly and seasonally to study the possible variations that might affect the performance of the cattle. The in vitro and in vivo dry matter digestibility of the diet, the roughage and concentrate were also determined.

It was found that the roughage fed to the cattle in the Project consisted of 79.6% grass and 24.4% broad leaf species during the wet season, whereas during the dry season, the proportion of the grass increases at the expense of the broad leaf species. On the other

hand, the cattle raised in the farm the feed consisted of grass (37.7 %), broad leaf species (25.9 %), shrub (7.5 %), tree leaves (13.3%), stems (12%) and fruits (3.6%).

The result showed that topography, land utilization, soil surface condition and climatic zone exerted some effects on the chemical composition of the grass, shrub and tree leaves.

2.6. Carcass Appraisal

When the cattle in each experiment reached live weight of 375 kg, it was slaughtered to study the effect of concentrate supplement on the dressing percentage, wholesale cuts, meat percentage, backfat thichness, loin eye muscle area and marbling score.

The dressing percentage the fore quarter and the meat and bone percentage of the concentrate supplemented cattle were higher than those raised traditionally.

Since Bali become the centre of tourist development for the middle part of Indonesia, portion of the carcass has been sent to an International Hotel to test the suitability of such beef to meet the tourist standard. The taste panel indicated that the By-products (Bali) beef is suitable for sirloin, fillet and rump steaks.

2.7. Predicting Live Weight with Body Dimension

Cattle scale is not readily accessable to the small holder farmers, so that farmers lost considerable money when selling at gate price by prediction of the middle-men. Possible correlation of live weight with various body dimensions (e.g. height at whither, chest girth, etc) could minimize the farmer lost.

For the concentrate supplemented cattle the best correlation ($r = 0.94$) is between the chest girth and live weight. However the use of body dimension (chest girth) to predict live weight is still under trial by the University and Department of Animal Husbandry. At present farmers are asked to sell their cattle direct to the sole yard, where cattle scale is available.

2.8. Training and Extension

One staff menber has been using part of the data of the By-products (Bali) for his research leading to a Ph.D. degree. There were 6 students studying the nutritional aspect, 8 students studying the economic aspect for the scriptions leading to "Sarjana" degrees.

Data of the By-products (Bali) have been presented in various scientific gatherings, massmedia and direct contact to the farmers through courses. Course on the practical fattening of Bali cattle has been held (Anon 1983).

2.9. Economic Evaluation

A survey was carried out to : 1) Compare the performance of Bali cattle raised under different rearing system, 2) to construct a model, and 3) to conduct economic analysis on the model. The complete result of this survey has been described in the supplementary report no.2 (Nitis et al. 1983).

The feed cost amounted to 83 - 95% of the total operating expenses. Output such as the sale of manure, premium carcass quality and income from ploughing amounted to 5 - 7, 7 - 8 and 21 - 32% of the total income generated by the cattle, respectively.

Rearing Bali steer traditionally for fattening purposes was not economically profitable measured in terms of B/C ratio, NPV and IRR. Fattening become more profitable when 30% rice bran + 10% layer manure for the starting live weight of 100 kg, with 10% copra meal + 10% rice bran + 10% cassava chips for the starting live weight of 250 kg or with 20% rice bran + 10 % layer manure for the starting live weight of 300 kg.

2.10. Follow-up Research

The 6 years experiments have shown that both the production and quality of Bali cattle can be increased by agro-industrial by-product concentrate supplement and such system could increase the economic return of the farmers.

For the above reason a follow-up research is carried out to study :

1) How the farmer will apply the new technology they have acquired
2) How willing are the farmers to set aside the concentrate which other wise for the non-ruminant
3) To test the farmer belief that the castrated cattle is easier to harde than the non-castrated cattle.

The data were collected from the farmer getting cattle credit (loan) from the BRI Bank and from the farmers getting cattle from the proceeds of cattle sole of the By-products (Bali).

Result of this follow-up research is published in a report entitled : "Implementation of the By-products (Bali) system to Bali cattle raised traditionally. It showed that farmers willing to supplement the cattle with concentrate whenever it is available For this reason, "Sago", is used as an alternative for the copra meal, rice bran and poultry manure.

2.11. Government and Farmer Participation

The head of Badung regency showing interest in the By-products (Bali) by renting 5 Ha lands to grow elephant grass as a feed reserve during the dry season.

There are 23 farmers participated in the project (core/nuclei farmers). 17 farmers leasing the cattle to be raised traditionally (peripheral farmers), 38 farmers aftending the course, 23 farmers participated in the follow-up research and 40 farmers visiting the project.

III. MATERIALS AND METHODS

3.1. Objective of the Post-Project Monitoring Study

To assess effects of research By-products (Bali) with respect to utilization of its research output and its contribution to indigenous research capacity in Bali.

3.2. Design of the Post-Project Monitoring Study

The survey is carried out by written and oral means. The enumerator asking directly the farmers the question and writting the aswer in the form provided

The question is concerning the husbandry and nutrition aspect of the cattle and social, economic and developmental aspects of the By-products (Bali).

The summative outline of the questionair as described in Annex 1.

The attitudes of the farmers concerning some items were monitored by applying the modified Likert scale method (Reich and Adcock 1976). For the take of simplicity in analysing the data, the "neutral scale" is joined with the "unfavourable" and the "most favourable" scale as the non- favourable; whereas the "most favourable" and the favourable" scale is united as the favourable attitudes toward the items stated.

Since financial analysys has been carried out in the previous economic evaluation, the present economic evaluation is putting more emphasize on the economic development of the farmers participated in the By-products (Bali). To examine whether there has been any significant economic impact on livestock production with the introduction of the By-products (Bali), a Cobb-Douglas production function is employed (Heady and Dillon 1964, Martin 1977). Using the Cobb-Douglas production frame work, the technological impact can be measured by evaluating changes in the respective parameter estimates.

The evidence of social benefit, particularly on the aspect of socio-cultural alternative in relation with the implementation of the By-products (Bali), was evaluated with a visibility study. The methodelogy adapted is

a) The correlative approach : relation between the main project findings with the socio cultural aspects in the community as a whole.
b) The micro approach : A special aspect of the socio-cultural symtoms that might have some influence on the implementation of the project findings.

The methodology is based on Koentjaraningrat (1958, 1982), while the analysis is based on Redfield (1956), Gorris (1960), Geertz (1961) and Geertz (1981).

3.3. Observation

The parameters being observed are :

a) Utilization of the research result
b) Evidence of social benefit
c) Evidence of economic benefit
d) Subsequent carreers of the members of the research teams.
e) Constraints in the implementation of the research output and the acquired skill.

3.4. Respondents

The primary data were obtained from the farmers, lecturers, technician, administrative officer, students participating in the projects. Primary data are also obtained from government and private institutions and individuals interested and involved directly and indirectly to the By-products (Bali). Number of samples as described in Table 3.1.

The secondary data are obtained from the report, letters and news regarding the By-products (Bali).

3.5. Data Collection and Tabulation

Each enumerator visited the respected respondent to ask the question described in the questionair form. The supervisor consisted of nutritionist, forage specialist, socio-anthropologist, economist and extentionist quickly browse the questionair from already completed to see if there is any uncertainty or ambiquisity.

Data in the questionair are transformed into absulute or relative (percentage) value accordingly. Only the average values are presented in the tables.

Table 3.1. Respondents of the Post-Project Monitoring Survey

No.	N a m e	Designation	Number as respondent
1.	Nuclei/core farmer	Those participating directly in the project	23
2.	Peripheral farmers	Those leasing the cattle to be raised traditionally	17
3.	Foolow-up farmers	1. Those getting cattle from the Bank	13
		2. Those getting cattle from the proceed of By-products (Bali)	12
4.	Visitor farmers	Those visiting the By-products (Bali)	10 (40)[1)]
5.	Course farmers	Those attending the fattening course as participant	38
6.	Extension officer	Those attending the fattening course as observers	3
7.	Department of Animal Husbandry Bali province	Institution that implementing the animal husbandry policy in the province	1
8.	Branch of the Department of Animal husbandry	Institution that implementing the animal husbandry policy in the regency	1
9.	Bali province Planning and Development Bureau	Policy making for Bali	1
10.	Regional Coordinator of the Dept. of Agriculture	Coordinating the Dept. of cash crop, plantation, fishery,forestry and animal husbandry.	1

Table 3.1. (Continued)

No.	N a m e	Designation	Number as respondent
11.	Bali cattle breeding and development project	Breed and selection to increase the performance of Bali cattle	1
12.	BI (Indonesian Bank)	Policy making for cridit to the farmers	1
13.	BRI (Indonesian People Bank)	Implementing the cridit to the farmers	1
14.	Bali Raya Canning Factory	Buying cattle for canning	1
15.	Bina Mulya Ternak Ranch, Sulawesi	Fattening cattle on pasture and concentrate supplement	1
16.	Bali Beach	Intercontinental Hotel	1
17.	Staff members	Those participated in the project	11
18.	Students	Those using the data from By-products (Bali) for research and skription writting	15
19.	Outside farmers[2)]	Those never participate directly or indirectly in the project	18
		T o t a l	170

1) In parenthesis is number of farmers visiting the By-products (Bali),
2) This survey was carried out so that the Cobb-Doughas analysis can be reliable.

VI. RESULTS

4.1. Utilization of the Research Result

4.1.1. Papers presented in the scientific gatherings

10 papers have been derived from the "By-products (Bali)" and presented in national, regional and international workshop, seminar or congress (Table 4.1.1).

4.1.2. Presented in the form of reports

Five annual progress reports and one final report have been presented during the 6 years periods. Another 3 supplementary report concerning economic evaluation, chemical composition and practical fattening course have been produced. One report on the follow-up research is under preparation (Table 4.1.2).

4.1.3. Presented through mass media

Mass media have been interested on the research results. The local newspaper "Bali Post" has written three articles, the "Tempo" magazine, Jakarta has written an article and Bali TV has produced a 30 minutes film on the TV program on the By-products (Bali). The result has also been published in the IDRC report (Table 4.1.3).

4.1.4. Institutions receiving the report

35 government and private institutions in the country are on the mailing list to receive the progress report, final report and supplementary report periodically. Due to financial constraints only 11 institutions and selected persons overseas are on the mailing list to receive the report (Table 4.1.4).

4.1.5. Institutions/persons asking for the report

There are 6 institutions in the country and 11 persons from overseas asking the report and reprints of the By-products (Bali) (Table 4.1.5).

Table 4.1.1. Papers presented in the scientific gatherings

No.	Name of the meeting	Place and time	Title of the paper	Authors
1.	Animal husbandry research and development seminar	Indonesia 5 - 8 November 1979	Effect of concentrate supplement on the body dimension and its correlation with live weight of Bali cattle in confinement	K. Lana, K. Ardika and I.M. Nitis
2.	2st AAAP Congress	Malaysia, 2 - 6 September 1980	Effect of concentrate supplements on Bali cattle performance under confinement	K. Lana and I.M. Nitis
3.	Animal husbandry research and development seminar	Indonesia, 23 - 26 March 1981	Effect of concentrate supplement on the body composition of Bali cattle	I.M. Nitis and K. Lana
4.	XIV International grassland congress	U.S.A., 15 - 24 June 1981	Effects of climatic zone, topography, land utilization and soil condition on the nutrient composition of the natural grasses in Bali.	I.M. Nitis and K. Lana
5.	IDRC Workshop	Kenya, 26 - 30 September 1982	Use of By-products to feed Bali cattle	I.M. Nitis
6.	Institute of National chemistry seminar	Indonesia, 10 - 12 January 1983	Effect of Agro-industrial by-product supplement on the performance of Bali cattle.	I.M. Nitis and K. Lana

Table 4.1.1. (Continued)

No.	Name of the meeting	Place and time	Title of the paper	Authors
7.	Institute of National chemistry seminar	Indonesia, 10 - 12 January 1983	In-vivo digestibility of diets consisted of grass and agro-industrial by-products feeds for cattle	K. Lana and I.M. Nitis
8.	National workshop on finance and administration	Indonesia, 15 - 17 March 1984	Research project By-products (Bali) : its finance and administrative problems and solution	I.M. Nitis, N. Sarma and K. Lana
9.	Annual workshop 5th AAFARR (Australian Asia Fibrous Agricultural Residues Research/ Network	Indonesia, 13 - 17 April 1985	Effect of replacing 30% of the green roughage with agro-industrial by-products on the performance of Bali cattle	K. Lana and I.M. Nitis
10.	XV International grassland congress	Japan, 24 - 31 August 1985	Effects of climatic,zone, topography, land utilization and soil condition on the mineral constituent of grasses in Bali.	K. Lana, S. Uchida and I.M. Nitis

Table 4.1.2. Data presented in the form of report

No.	T i t t l e	Status	Year	Authors
1.	Effects of replacing 30% of the grenn roughage with concentrate on the performance of Bali steer	1st year progress report	1979	I.M. Nitis
2.	ditto	2nd year progress report	1980	I.M. Nitis
3.	ditto	3rd year progress report	1981	I.M. Nitis
4.	ditto	4rd year progress report	1982	I.M. Nitis
5.	ditto	5th year progress report	1983	I.M. Nitis
6.	ditto	Final Report	1984	I.M. Nitis and K. Lana
7.	Practical sourse in fattening Bali cattle	Supplementary report No. 3	1983	Anonymous
8.	Evaluation of various Bali cattle rearing system at Kecamatan Petang, Bali	Supplementary report No.2	1983	I.M. Nitis, K. Lana, M. Dirgayusa and W. Sukanten
9.	Chemical composition of grass, shrub and tree leaves in Bali	Supplementary report No.1	1985	I.M. Nitis and K. Lana
10.	Implementation of the By-products (Bali) system to Bali cattle raised traditionally	Follow-up research	(in press)	I.M. Nitis, K.Lana, W. Su Sukanten, T.G.O. Susila and Sentana Putra.

Table 4.1.3. Results presented through mass media

No.	Name of the mass media	T i t t l e	Date of circulation
1.	Bali Post Newspaper	A visit to the Bali cattle fattening program at Petang[1)]	5 July 1980
2.	Bali Post Newspaper	Agro-industrial by-products could double Bali cattle production[1)]	6 November 1980
3.	Bali Post Newspaper	Increasing Bali cattle production by poultry manure feeding[1)]	10 December 1981
4.	Tempo Magazine, Jakarta	Utilization of agro-industrial by-products to fatten Bali cattle[1)]	7 July 1982
5.	Bali TV program	Fattening Bali cattle to support Bali Development. 30 minutes serial on the TV program : Bali Development[1)]	7 July 1983
6.	Kompas Newspaper, Jakarta	Livestock production in Bali can be increased by feeds and feeding[1)]	2 October 1985
7.	The IDRC Report	The UN-CATTLE of Bali by Anne Fisher	Vol. 1, no.3 and 4 October 1985

1) In Indonesia language.

Table 4.1.4. Institution receiving the report

No.	Name of the institution/person	Report sent (vide 4.1.2.)	Remark
	In the country		
1.	LIPI Jakarta	1, 2, 3, 4, 5, 6, 7, 8 and 9	The counterpart agency
2.	Derectorat research and development of the Ministry of Education, Jakarta	1, 2, 3, 4, 5, 6, 7, 8 and 9	
3.	Department of Animal Husbandry, Jakarta	6,7, 8, and 9	
4.	Young Mister of Animal Husbandry and Fisheries, Jakarta	6, 7, 8, and 9	
5.	Indonesian Decumentation Centre, Bogor	6, 7, 8, and 9	
6.	Indonesian Annual Research Centre and Development, Bogor.	6, 7, 8, and 9	
7.	BIOTROP, Indonesia, Bogor	6,7, 8, and 9	
8.	Faculty of Animal Husbandry	6, 7, 8, and 9	14 Faculties in various places in Indonesia
9.	Department of Animal Husbandry provincy of Bali	6, 7, 8 and 9	With its 8 sub-branches
10.	Biro of planning Bali provincy	6, 7, 8 and 9	
11.	Governor of Bali province	1, 2, 3, 4, 5, 6, 7, 8 and 9	
12.	Head of Badung regency	1, 2, 3, 4, 5, 6, 7, 8 and 9	
13.	Udayana University library	1, 2, 3, 4, 5, 6, 7, 8 and 9	
14.	Udayana University research centre	1, 2, 3, 4, 5, 6, 7, 8 and 9	

Table 4.1.4. (Continued)

No.	Name of the institution/person	Report sent (vide 4.1.2.)	Remark
	Overseas		
1.	IDRC regional office	1, 2, 3, 4, 5, 6, 7, 8, and 9	Granting Agencies
2.	Nutrition Abstract and Review Journal, England	6 and 9	
3.	CSIRO, Brisbane Australia	6 and 9	
4.	INFIC, Australia	9	
5.	FAO, Rome	6 and 7	
6.	Rice farming system, IRRI, Philippines	6 and 9	
7.	Department Animal Science, Kon Khaen University (Dr. Khajaren)	6 and 9	
8.	Department of Animal Science University Pertanian Malaysia (Prof. Hutagalung)	6 and 9	
9.	Mardi, Malaysia	6 and 9	
10.	EDI, world bank (Prof.Gittinger)	8	Asking for comment
11.	Department of Agriculture Qld. University, Australia	6 and 9	

Table 4.1.5. Institutions/persons asking for the Report

No.	Name of Institutions/persons	Report asked (vide 4.1.2)	Remark
	In the country		
1.	"Bina Mulya" Ranch enterprise, Sulawesi	No. 6 and 9	By letter
2.	World neighbour, NTT	No. 6 and 9	Personal communication
3.	Canning Factory, Denpasar	No. 6 and 9	Personal communication
4.	Director of Planing of Animal Production, Jakarta	No. 6	By letter
5.	"YAPESMA", Jakarta	No. 6 and 9	By letter
6.	Pos Karantina Pertanian Kalimantan Timur	No. 6 and 9	By letter
7.			
	Overseas		
1.	Dr. Ranjhan, Philippines	No. 9	Personel communication
2.	Dr. Castillo, Philippines	No. 9	Personel communication
3.	Dr. Harris, Utah University	No. 9	Personel communication
4.	Dr. G. Blair, Australia	No. 9	Personel communication
5.	Dr. L.R. Humphreys, Australia	No. 9	Personel communication
6.	Dr. Russel Kyle, England	No. 6 and 9	By letter (to write book on Bali cattle)
7.	Miss Liliane Saile, France	No. 6 and 9	Personel communication (to write M.Sc. thesis on Bali cattle).

Table 4.1.5. (Continued)

No.	Name of Institutions/persons	Report asked (vide 4.1.2.)	Remark
8.	Professor Noel D. Vietneyer, N.R.C., U.S.A.	No. 1	By letter to write book on Bali cattle)
9.	Dr. A. Calub, Philippines	No. 6 and 9	Personel communication
10.	Dr. M. Seadullah, Bangladesh	No. 9	Personel communication
12.	Dr. F. Dolberg, Denmark	No.6 and 9	Personel communication

4.1.6. The report and papers cited as reference

Four authors have cited the result of By-products (Bali) as references in their papers or books writting. Leader of By-products (Bali) has cited the result of By-products (Bali) in his 5 papers presented in the regional and international scientific gatherings. INFIC cited one of the report on publication of interest (Table 4.1.6).

4.1.7. Use of the concept of By-products (Bali) for research proposal

One senior lecturer from the Department of Food Technology has cited the concept of 70 : 30 roughage : concentrate ratio to formulate diet for cattle in his experiment for a Ph.D. disertation (Table 4.1.7). Two other junior lecturer from the Departement of Nutrition and Tropical Forage Science have cited the concept of the roughage : concentrate ratio to propose research fund to the Directorate of Research and Development of the Ministry of Education, Jakarta.

4.1.8. Institutions interested in implementing the research result

A ranch in South Sulawesi is preparing a feed lot feeding to fatten the cattle by using agro-industrial by-product supplement. The Dept. of Animal Husbandry Bali Province, has conducted demonstration feeding trials in 3 villages in Bali on the by-product supplementation for veal and vealer production (Table 4.1.8). BRI (Indonesian People Bank) has given credit to 13 farmers formerly participated in the By-products (Bali). A workshop conducted by the Directorate General of Animal Husbandry, Jakarta in 1983 has discussed the possibility of implementing the By-products (Bali) finding to fatten small holder cattle in various places in Indonesia.

Table 4.1.6. Report of/paper from By-product (Bali) cited as references

No.	Name of the authors using as reference	Paper/publication			Title of the By-product (Bali) being cited
		Title	Year	Publisher/host	
1.	I.M. Nitis	Beef cattle and water buffalo production in South East Asia	1980	IFI-APHCA Workshop Philippines	1st Progress report (vide Table 4.1.2.)
2.	I.M. Nitis	Feed analysis : the needs of developing countries	1983	2nd International INFIC symposium Australia	4th year Progress (vide Table 4.1.2.). Supplementary Report (vide Table 1.4.2)
3.	I.M. Nitis	Utilization of tropical forage and agro-industrial by-products	1985	3rd AAAP Congress Korea.	Final Report (vide Table 4.1.2.) and No,4 (vide Table 4.1.1.).
4.	I.M. Nitis	Present State of grassland production and utilization and future perspective for grassland farming in humid tropical Asia.	1985	XV International grassland congress, Japan	Final Report and supplementary report no.1 (vide Table 4.1.2.).
5.	I.M. Nitis	Fodder trees for small holder farming system	1985	16th workshop IRRI, Bangladesh	Final report and supplementary report no.1 (vide Table 4.1.2.)

Table 4.1.6. (Continued)

No.	Name of the authors using as reference	Paper/publication			Title of the By-product (Bali) being cited
		Title	Year	Publisher/host	
6.	N R C	Little known asian animals with a promising economic future	1983	National Academic Press, Washington, D.C.	1st Progress Report (vide Table 4.1.2.).
7.	Soedomo et al.	Non leguminous trees and shrub as source of fodder for ruminants	1985	ACIAR : Forage in Southeast Asa and South Pacific Agri culture, Indonesia.	Final Report and supplementary report (vide Table 4.1.2.).
8.	Ranjhan,S.K.	The contribution of various food sources to ruminant production in south east Asia	1985	ACIAR : Forage in Southest Asian and South Pasific Agriculture, Indonesia.	Supplementary report no.1 (vide Table 4.1.2.).
9.	Masud Panjaitan and G.J. Blair	Research on the use of Leucaena and other tree and shrub legume in Indonesia	1985	ACIAR : Internal workshop on shrub legume in Indonesia and Australia.	Based on : Final report (vide Table 4.1.2.)
10.	INFIC	Newsletter no.14 31 July 1985 : Publication of Interest.	1985	INFIC, Australia	Supplementary report No.1.

Table 4.1.7. Person citing the concept of By-product (Bali) for research proposal

No.	Name of the person	S t a t u s	Title of Research proposal	The concept cited from By-products (Bali)	Designation of the proposal
1.	Ida Bagus Arka	Lecturer in the Dept. of Food Technology, UNUD	Effect of fattening on the carcass quality of Bali cattle	Roughage : concentrate ratio : 70:30	Indonesian Ph.D. Program, Jakarta
2.	C.G.O. Susila	Lecture in the Dept.of Nutrition and Tropical Science, UNUD	Concentrate supplement to fodder shrub based diet for goat	Roughage : concentrate ratio : 70:30	Director of Research and Development, Jakarta
3.	M. Semadi	Lecture in the Dept.of Nutrition and Tropical Science, UNUD.	Concentrate supplement to fodder tree based diet for goat	Roughage : concentrate ratio : 70:30	Director of Research and Development

Table 4.1.8. Person/Institution interested in implementing the research result

No.	N a m e	Mode of implementation	Remark
1.	PT. Bina Mulya Ternak, Ranch, Persero, Sulawesi	Feed lot fattening with concentrate, after grazing	Under preparation
2.	Department of Animal Husbandry Province of Bali	Demonstration unit for feeding agro-industrial by-products supplement for calf rearing in 3 villages in Bali	1. Anonymous (1981). Report on the Veal production in village. Dept. Animal Husbandry Report series : Denpasar. 2. Anonymous (1982). Report on the Veal and vealer production. Dept. Animal Husbandry Report series : Denpasar.
3.	BRI (Bank Rakyat Indonesia) : Denpasar	Cridit for 13 farmers at Petang village	Already running for 1 year (started in 1984) and proposed for 3 years duration.
4.	Directorat Jendral of Animal Husbandry. Planning : Jakarta.	Policy making to be implemented in the field	Meeting and data collection and draft proposal

4.1.9. Direct contact communication

Practical skill are acquired by the farmers and students by working and doing practical attachment in the By-products (Bali). Theoritical skill are acquired by farmers and students by attending the course, attending the lectures and visiting the By-products (Bali) (Table 4.1.9).

4.1.10. Institutions willing to accept cattle raised on the By-products (Bali) system

PT. Bali Raya is prepared to accept the cattle for canning, Hotel Bali Beach is prepare to accept the carcass for beef dishes, the local butcher is prepare to accept the entrails and the retailer is prepare to accept the skin for handicrafts (Table 4.1.10).

4.2. Evidence of Economic Benefit

Evidence of economic benefit measured quantitatively presented as follows.

4.2.1. Cattle turn over is faster

Cattle raised traditionally required length of time 3 - 9 years and the core farmers require 2.5 - 3 years, while cattle raised by other type of farmer, such as the peripheral farmers require 3 - 5 years or an average of 4.34 years to reach market weight. This mean that by By-products (Bali) system, more cattle can be sold at a given time compared with the cattle raised traditionally. For example core farmer need only 2.75years average length of time to get market weight 375 kg.

This evident suggests, that By-products (Bali) system (method) faster turn over than the traditional one, i.e. $\frac{5.7}{3.5}$ is equal to 1.63. This figure give us an idea that, to get 375 kg, By-products (Bali) only need almost half time, as compared to the traditional system.

Table 4.1.9. Direct contact communication

No.	Person	Mode of contact	Number participate	Aims of contact
1.	Farmers (nucleus/core)	Ask the parmers to raise the cattle in the project	22	Give practical and technical knowledgeds by instruction
2.	Farmers (periphery)	Ask the farmer to raise the cattle outside the project	30	Give practical and technical knowledged by passive learning
3.	Farmers and non-farmers	Visiting the project and discussion with farmer no.1	40	Spread the idea of By-products feeding system
4.	Farmers and extension officer	Courses on practical fattening of Bali cattle	43	Giving practical and technical knowledge in raising Bali cattle for fattening
5.	Students taking subject in Ruminant Nutrition	Lecturers and practical demonstration	245	Science and practical knowledges
6.	Lecturer from 8 Universities in Indonesia : attending course in Applied Ruminant Physiology	Practical visit to the project	16	Practical attachment

Table 4.1.10. Institution willing to accept cattle from By-products (Bali)

No.	Name of Institution	Product accepted	Remarks
1.	PT. Bali Raya Canning Factory, Denpasar	Carcass	All right for canning
2.	Bali Beach Hotel (HBB), Denpasar	Loin and rump	After taste pannel carried out buy the HBB food and beverage staff, HBB willing to accept meat from cattle fattened by By-product system.
3.	Butcher, Denpasar	Entrils	All right for Indonesian cooking
4.	Skin retailer, Denpasar	Skins	All right for handycraft

The above statement is backed up by the following reality. The elementry method to calculate the efficiency of resources used is the amount of cost spend on particular operation in order to get a certain amount of income or rupiah (dollar). For that purpose, an average income generated from cattle sold (is presented on Table 4.2.5) and the amount of expenses spend on current input (such as, feed, concentrate, etc. is presented on Table 4.2.6) is compared. Depreciation on tool equipment should be included is the calculation. But this factor was ommitted from analysis, because the figure is not performed a significant differences among groups of farmer (Table 4.2.8).

The result of efficiency calculation is presented on Table 4.7. The result is 1.67 for the core farmer and 1.17 for traditional farmer. This mean that core farmer is more efficien as compare to the traditional system. If Rp 1.- is spend by the core farmer they will get Rp 1.67 but on the other hand, for the traditional farmer Rp 1.-they spend give returns only Rp 1.17. The core farmer also more efficient in using their resources as compared to peripheral, follow-up and trained farmer. From the above analysis, it is indicated that By-product (Bali) was more efficient in using the resources (feed resources) as compared to the other group of farmer : i.e. 1.31; 1.59 and 1.42 for peripheral follow-up and trained farmer, respectively. The alternative method to examine resource used efficiency is by estimating the respond function of the livestock. This method usually used in agricultural research. In this analysis, this method is applied in order to confirm above finding in resource use efficiency. Concequently, to examine whether there has been any significant economic impact on livestock production function with the introduction of the livestock project (new technology on livestock production) into Kecamatan Petang (Badung, Bali), a Cobb-Douglas production function is employed.

For more detail figure Table 4.2.1 gives detail figure on length of time needed by each type of farmer. Core farmer need least time to get 375 kg as compare to peripheral, follo-up and trained/course farmer.

Apart from the price of the pork is cheaper than the price of the beef (Rp 2000.- vs Rp 2500.-), Balinese using a lot of pigs (sucker, porker and baconner) for religious/ritual ceremoney. On the other hand, cattle is not used for ritual ceremoney (except in a rare and specific occaaion), so that the surplus cattle is for canning factory and for export. The present quota of canning factory (28,000 head/year) and the export (25,000 head) can be increased, when the by-products (Bali) system can be implemented.

4.2.2. Increase fertility of the land as a concequent of better quality of manure

4.2.2.1. Increase fertility of the land

In the cattle raised traditionally, the cattle manure spread in the field not by carrying the manure, but by moving the cattle stall from one place to the other every 6 - 12 months. Therefore the manure is not spread evenly on the soil. In the By-products (Bali) the cattle is kept in the stall all the times and the manure is kept in the pitch. Every 6 months the core farmer carted the manure to their respective field and spread evenly on the soil. The core farmers claimed that their lands look greener and their trees look heal their compared with those 3 - 4 years ago.

4.2.2.2. Better quality of manure

In the cattle raised traditionally the feed wastage mentioned is used as bedding or thrown to the manure heap, so that manure contained a lot of green feed wastage. On the other hands, very little feed wastage if left, in the B-products (Bali), so that the cattle manure mostly consisted of

Table 4.2.1. Average number of years cattle raised before sold, by type of farmer, Petang, 1984/1985

Class interval (year)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
1 - 3	5	0	0	0	0
3 - 5	16	16	6	8	7
5 - 7	0	2	4	25	6
7 - 9	0	0	2	0	5
N	21	16	12	33	18
X	3.5	4.3	5.3	5.5	5.7

Core farmer as compared to peripheral, follow-up and trained/course farmer are as follow : 1,29; 1.51; 1.57 respectively.

Table 4.2.2. Average income from crop sold other than cattle by type of farmer, Petang, 1984/1985

Class interval (in Rp 1000)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 300	2	3	2	3	12
300 - 600	6	4	6	25	5
600 - 900	8	8	4	5	0
900 - 1200	5	1	0	0	1
N	21	16	12	33	18
X	678,571	581,250	500,000	454.545	283,333

cattle dung and urine. This manure is easier to disverse in the soil than the manure contaminated with a lot of grasses.

The two finding mentioned above can be approved by examining the amount of income generated from crop harvested in the land area around the cattle stall. It is one way to examine the good impact on manure to soil, which impact a good crops. Table 4.2.4. presents the productivity value of the land. This Table is generated from Table 4.2.2. and Table 4.2.3. to follow. Table 4.2.2. presents the value of income generated from crop by type of farmer group. Table 4.2.3. presents the average area of land supplied manure by type of farmer.

From Table 4.2.4. one can observed that productopn value of land operated by the core farmer is almost 4 time higher as compared to the traditional faarmer, and 1.6; 1.5; 1.6; have respectively as compared to trained course, follow-up and peripheral farmer. From the analysis, it can be concluded that the core farmer had the best production value of the land, because of a good quality manure supplied to the soil and increased the fertility of the soil, which result a good crop and a good income generated from crop harvested. This analysis results is done, and back up by the reality that the land condition, altitude and climatic, even the crop they plants is homogenous, such as cassava, bananas, jack fruit, clove, coconut, etc.

4.2.3. More efficient utilization of feed resources

The By-products (Bali) has shown that agro-industrial by-products not only for pigs but also good for cattle (vide 4.3.3.), and the tree fodder not only used as feed supplement to cattle during dry period, but could be mixed with grass with good growth respond (vide 4.3.4). With proper feed combination, the time of the cattle to reach market weight is faster so that the feed cost can be reduced.

Table 4.2.3. Average dryland farming area owned by type of farmer Petang, 1984/1985

Class interval (in are)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 50	10	2	5	17	1
50 - 100	5	8	5	8	5
100 - 150	5	4	-	2	8
150 - 200	-	1	1	3	4
200 - 250	1	1	1	3	-
N	21	16	12	33	18
X	70.24	96.88	75.00	75.00	116.67

Table 4.2.4. Productivity value of dryland owned by type of farmer, Petang, 1984/1985 (value of crop devided by land area)

Variable	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Average product value (in Rp 1000)	678.571	581.250	500.000	454.545	283.333
Average land area (in are)	70.24	96.88	75.00	75.00	116.67
Productivity	9.661	6.000	6.6667	6.061	2.428
Value per are (in Rp 1000)					

Note :

- Calculated from Table 4.2 and Table 4.3.
- Productivity value = $\frac{\text{Average product value of the sample farm}}{\text{dry land area for crops}}$

The Cobb-Douglas function is a simple functional form which is computationally economical yet yields statistically significant parameter estimates without making exessive demands on the available data (Heady and Dillon 1968).

With farm sample data, Heady and Dillon have recommended the use of the Cobb-Douglas input-output relationship in livestock production because of the smaller number of degrees of freedom involved in estimating the parameters, and because a multiplicative model seems logically appropriate.

In particular, with the relevant data range, the marginal product of a Cobbs-Douglas function decreases at an increasing rate, a statistical imperative which is fully consistent with the low of diminishing returns. Without imposing restrictions on the parameters estimates, the Cobb-Douglas production function is also convenient form to use to determine the existance of economics of scale. Also, logarithmic transformation of the Cobb-Douglas production function has been widely used, because of convenience in intepreting elasticities of production.

MODEL SPECIFICATIONS

In the present economic analysis (study), the following basic models is employed.

$$Y = bo\ X_1^{b1}\ X_2^{b2}\ X_3^{b3} \quad exp.\ u. \qquad (1)$$

Where :

- Y = Cattle production in unit of live cattle sold during the period of 1984/1985.
- X_1 = Capital expenditure in term of amount of depreciation on tool equipment used by the farmer in terms of Rp 1.000.-
- X_2 = Man hours labor used to raise the cattle
- X_3 = Amount of current input spend in term of Rp 1.000.- (such as feed, concentrate, medicine, etc).
- exp. = logarithms to the base 10
- v = a disturbance term
- bi (i = 0, 1, 2, 3) are parameter estimates.

Table 4.2.5. Average income generated from cattle sold, by type of farmer (in thousand Rupiah), Petang, 1984/1985

Class interval (Rp 1000)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 300	0	0	0	0	0
300 - 600	0	6	3	15	18
600 - 900	11	10	9	18	0
900 - 1200	10	0	0	0	0
N	21	16	12	33	18
X	892.857	637.500	675.000	613.636	450.000

Table 4.2.6. Average expenses on current input by type of farmer (in Rp 1000), Petang 1984/1985

Class interval (in Rp 1000)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 300	0	2	2	3	4
300 - 600	15	10	9	29	14
600 - 900	6	4	1	1	0
900 - 1200	0	0	0	0	0
N	21	16	12	33	18
X	535.714	487.500	425.000	431.818	383.333

Table 4.2.7. Efficiency rate of resources allocation

Variable	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Average income	892.857	637.500	675.000	613.636	450.000
Average expenses	535.714	487.500	425.000	431.818	383.333
Efficiency rate	1.67	1.31	1.59	1.42	1.17

Note : Calculated from Table 4.5 and 4.6.

Table 4.2.8. Average depreciation on tool equipment used, by type of farmer, Petang, 1984/1985

Class interval	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 3000	-	-	-	1	-
3000 - 6000	1	1	1	3	1
6000 - 9000	2	2	1	4	4
9000 - 12000	10	9	8	20	1
12000 - 15000	5	3	2	4	3
15000 - 18000	3	1	-	1	3
N	21	16	12	33	18
X	11.500	10.687	11.000	9.863	11.000

Measuring technological impact on livestock production :

Using a Cobb-Douglas production function framework, technological impact can be measuredby evaluating changes in the respective parameter estimates. For instances, in the case of two factors inputs, let us say, capital (K) and labour (L), this can be estimated for two or more sets of data to obtain :

$$\text{Log } Y = \log bo + b1 \log K + b2 \log L$$

Then a fall in the value of b1 relative to b2 would indicate that a labour using technology has been adopted, where as if the elasticity of production of capital (b1) rises relative to b2 (labour coeficient), this would indicate that a capital using technology has been adopted. Thus,any non-neutral technological change is represented by a change in the ratio of b1 and b2 proportionally.

On the other hand, if the constant term log bo changes significantly, while the ratio of bi/b2 remains constant, than we would have a neutral technological impact.

By a similar procedure, one might describe the nature of technological impact using a Cobb-Douglas production function involving more than two factors inputs. Based on the abovementioned theory the following finding was arise from the analisist (see Table 4.2.9).

The regression coeficients was significantly different at 1% level. The regression coeficient on capital used and current input was much higher compared to labour coeficient in all cases.

Specifically, core farmer regression coeficient is much higher compared to traditional farmer group. This mean the elasticity of production is higher; which is mean core farmer is more responsive than the traditional farmer in adopting the technology in his production processes.

Surprisingly, those factors included in the model was highly determine the output changes; its indicated by the high R^2 coeficient.

By this finding, indicated that core farmer By-product (Bali) more responsive in adopting the technology.

Table 4.2.9. Regression coeficient for each type of farmer, Petang, 1984/1985

Variables	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Constanta	0.3096	0.2354	0.2053	0.3418	0.3546
Capital	0.4837	0.5083	0.4280	0.4598	0.4273
	(0.081)	(0.67)	(0.053)	(0.101)	(0.080)
Labour	0.0128	0.0201	0.0171	0.0142	0.0111
	(0.039)	(0.076)	(0.065)	(0.0035)	(0.0044)
Current input	0.4497	0.3782	0.3845	0.4545	0.3748
	(0.048)	(0.034)	(0.054)	(0.041)	(0.015)
Ebi	0.9462	0.9066	0.8296	0.9285	0.8132
R^2	0.91	0.87	0.88	0.89	0.84
N	21	16	12	33	18

Note - Number in parenthesis is standard error to respective coeficients.

- All coeficients significant at 1%.

Resource use efficiency :

This analysis will involve the measurement of Marginal Physical Products (MPP), Marginal Value Product (MVP) and Factor (Acquisition) costs.

Economic theory indicates that resources is used most efficiently if Marginal Value Product (MVP), of the input in question is just sufficient to offset its cost. This is a necessary condition for profit maximization.

The Marginal Physical Product of an input is defined as a ratio of the percentage change in output to the percentage change in input, with all other inputs held constant at their arithmetic mean. In common algebraic form, the Marginal Physical Product (MPP) of the i^{th} input is given by the following equation :

$$MPP_{xi} = \frac{dy}{dxi} = bi \left(\frac{Y}{xi} \right) \quad \ldots\ldots\ldots \quad (3)$$

Where :

bi = The coeficient measuring the proportional relationship between specific input changes and output changes when all other variables are being held constant.

Y = The level of output estimated at the means Arithmetic means of each input.

xi = The i^{th} input at its Arithmetic mean.

Further analysis is the MVP: which is obtained by multiplying the MPP by the price of per unit of life cattles, that is :

$$MVP_{xi} = MPP_{xi} \cdot PY \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (4)$$

Where :

MPPxi = Is marginal product of input xi

Py = The price per unit of live weight cattle

The next step to determine resource use efficiency is to calculate the ratio of MVP_{xi} of the input to its factor cost (Pxi). That is :

$$\text{Ratio} = MVPxi : Pxi$$

$$\text{or Ratio} = bi \frac{Y}{xi} \left(\frac{Py}{Pxi} \right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots (5)$$

Inputs are being used efficiently when the values are equal to unity.

Table 4.2.10. Arithmetic mean of output, capital, labour and current input, 64 type of farmer

Variable	Type of farmer				
	Core	Peripheral	Follow up	Course	Traditional
Out put (in Rp 1000)	892.857	637.500	675.000	613.636	450.000
Capital (in Rp 1000)	11.500	10.687	11.000	9.863	11.000
Labour (in man hrs)	1488.10	1312.50	1333.33	1431.82	1194.44
Current input (in Rp 1000)	535.714	487.500	425.000	431.818	383.333

Sources : Tables : 4.5, 4.6, 4.8 and 4.11.

Table 4.2.11. Average man hours spent on cattle raising per year, Petang 1984/1985

Class interval	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 500	0	0	0	1	1
500 - 1000	3	4	2	1	6
1000 - 1500	5	6	6	16	6
1500 - 2000	10	6	4	15	4
2000 - 2500	3	0	0	0	1
N	21	16	12	33	18
X	1488.10	1312.50	1333.33	1431.82	1194.44

Table 4.2.12. Marginal physical product of each input factor, by type of farmer (in unit of cattle sold)

Variable	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Capital	37.55	30.32	26.26	28.61	17.48
Labour	0.003	0.010	0.009	0.006	0.004
Current input	0.75	0.49	0.61	0.65	0.44

Table 4.2.13.A. Marginal value product of each input, by type of farmer (in Rupiah)

Variable	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Capital	37550	30320	26260	28610	17480
Labour	8	10	9	6	4
Current input	750	490	610	650	440

Appliying the above mentioned methods the following finding on resources used efficiency is happened on the sample survey. Table 4.2.13.B.presents the coeficient of resource used efficiency of sample farmer. The analysis is based on the calculation of Marginal Value Product, on Table 4.2.13.A. and Table 4.2.12 on Marginal Physical product.

Its is found, that only capital being used efficiently, not for current input and labour. Above all, the core farmer has applied the current input, though less efficient in using labour compare to the group of farmer. In this cases. it might be, caused by his psycological fear, in which case they should put more attention on their cattle. And concequently they spent more hours on their operation.

4.2.4. Increase carrying capacity of the land

In the small holder farming system in Petang, the average cattle ownership is 2 beast per farm. The By-products (Bali) has shown that the core farmers can look after up to 5 cattle without much interfering their daily farm activity.

The above finding is backed up by the following analysis (see Table 4.2.14) from the sample survey. The sample average carrying capacity as presented in Table 4.2.14 shows that the core farmer own much more cattle as compared to traditional farmer i.e. 5.5 head for core farmer and 3.2 head for traditional farmer. The core farmer carrying capacity also much higher as compared to peripheral, follow-up and trained farmer i.e. 4.1 head, 3.8 head and 3.6 head respectively.

Higher carrying capacity for the core farmer also reflect larger land area needed for cattle barn or stall i.e. 1.27 are; 1.22 are 1.00 are; 0.87 are and 0.28 are for core farmer, peripheral, follow-up, trained; and traditional farmer as presented in Table 4.2.15.

Table 4.2.13.B. Efficiency coeficient of each factor, by type of farmer

Class interval	Type of farmers				
	Core	Peripheral	Follow-up	Course	Traditional
Capital	37.6	30.3	26.3	28.6	17.5
Labour	0.07	0.08	0.08	0.05	0.03
Current input	0.8	0.5	0.6	0.7	0.4

Note : Efficiency coeficient was computed by comparing Marginal Value Product to price of input per unit, respectively.
i.e. Price of capital per unit is Rp 1000.-
Price of labour per hours is Rp 125.-
Price of current input per unit is Rp 1000.-

Table 4.2.14. Average number of life cattle owned by type of farmer, Petang, 1984/1985 (in head)

Class interval (in head)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 2	0	1	2	3	1
2 - 4	2	5	3	16	14
4 - 6	16	10	7	14	3
6 - 8	3	0	0	0	0
N	21	16	12	33	18
X	5.5	4.1	3.8	3.6	3.2

Table 4.2.15. Average land used for (cattle) stall, by type of farmer, Petang,1984/1985

Class interval (in are)	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 0.50	-	-	3	7	17
0.50 1.00	5	7	3	12	1
1.00 - 1.50	10	3	3	13	0
1.50 - 2.00	6	6	3	1	0
N	21	16	12	33	18
X	1.27	1.22	1.00	0.87	0.28

Table 4.2.16. Average value (current value) of investment in turn of life cattle owned by type of farmer, Petang, 1984/1985

Class interval	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
0 - 300	-	-	-	2	1
3000 - 600	3	5	5	8	3
600 - 900	8	6	3	15	10
900 - 1200	7	5	4	8	4
1200 - 1500	3	-	-	-	-
N	21	16	12	33	18
X	892.857	750.000	725.000	713.636	733.333

But if we compared the value of cattle owned by type of farmer, there are slightly different between core farmer to the other group of farmer. Supposedly, this slight different is due to the age of the cattle own by the farmer. Which is reflect the value of the cattle (see Table 4.2.16).

4.2.5. Reduce the feed wastage

In the cattle raised traditionally, the cattle usually tethered in the morning and kept in the stall the rest of the day. With this system the cattle only fed once a day by putting all the feed in the feed trough, so that a lot of feeds are wasted on the ground. In the By-products (Bali) system, the cattle is fed twice : in the morning and in the evening, so that little feeds are wasted on the ground.

It sould be admitted, that some difficulties is faced in order to quantify the amount of feed wastage. Though, some efforts and probing during the survey has been made .
And finally feed wastage is found in the value term, rather than physical. With the asumption that, higher value of feed wastage is consider bigger amount of feed wastage; the survey indicates, the core farmer has been produced less feed wastage compare to traditional farmer for peripheral farmer, i.e. 11.6 unit feed wastage produceed by core farmer, which is less then 52.01; 52.0; 61.5 for traditional, follow-up and trained farmer respectively. The core farmer has reduce the feed wastage higher compared to the other group of farmer (Table 4.2.17).

4.3. Evidence of Social Benefit

Livestock raising in Bali is a sideline job, to fullfil certain social function in the daily life of the farmers. For instance, farmer kept cattle, buffalo and horse mainly as work animals, whereas pig and chicken raising is mainly for religious and cultural ceremonies.

Table 4.2.17. Unit and value of feed wastage produced by type of farmer

Classification	Type of farmer				
	Core	Peripheral	Follow-up	Course	Traditional
Value of feed wastage (Rp)	1155.32	1155.32	5198.83	6153.93	5201.49
Unit of feed wastage (in unit)	11.6	11.6	52.0	61.5	52.0

Note : 1 units is equivalent to Rp 100 value of feed wastage.

Eventhough livestock raising in the confinement has been practised a long time ago, however, in some places and whenever possible, farmers prefer to keep the livestock loose or tethered in the field. This is usually practised in the public field or after the cash crop season when no valuable crop is grown in the field.

There is a close relationship between the farmer and his livestock. Such close relation is manifested in practice by not keeping certain animal for the sake of the others. For instance in some places in Bali, cattle and buffalo are not to be raised together. Similar attitude is also held true for bull (non-castrated) and bullock (castrated) cattle.

Eventhough the By-products (Bali) has been running for 7 years, it is a bit difficult to find out a definite social benefit of the presence of By-products (Bali) in that area. However, the following change of attitude may have been induced by the By-products (Bali).

4.3.1. Formation of a farmer group

Living in a group is one of the specific characteristic of the Balinese. Traditionally Balinese farmers have known various groups in the community. Such group called"SEKEHE", which is also found in Petang, can be permanent (from generation to generation) or temporary, covering the whole aspects of social activities in the village. Such "Sekehe" system has some important bearings on the acceptance of the farmers to the By-products (Bali) systems.

One of the Government programs is the formation of farmer group ("Kelompok Tani"). Eventhough this Kelompok Tani has different structure, the mission is similar, so that it can easily be adopted by the farmers.

The interest in forming"Kelompok Tani" is very encouraging (Table 4.3.1). This is particularly interesting when the course farmers interest arouse from their own willingness to attend course and to form farmer group.

On the other hand, the small percentage of the farmers not interested in forming the farmer group, are those who belong to the slowly motivated farmers. They have the wrong impression that the program set forth by the farmer group is complicated to follow.

Most farmers saw the importance of the farmer group for is helps in getting subsidy and help from one another ("Gotong royong"). It is the policy of the Government that subsidy to individual famer is given through the farmer group organization. Further more, even though some farmers had never been receiving credit from the Bank (Table 4.3.2 and 4.3.3), they still expect that the farmer group organization can play a certain role in the credit allocation.

The interest of the farmer in getting credit from the bank indicates that there is a shift in the attitude of the farmers, from the traditional, low risk, subsistance production to added value production. The interest to get credit is not only for livestock (particularly cattle) but also for economic plants (e.g. vanila and clove) which is considered as high-risk commodity.

For the farmers participated in the project the core and peripheral farmers meet every 28 days in the project site because they have to weigh the cattle. They discussed why some cattle why some cattle gain a lot of weight and why other cattle gain little weight. When the Project was completed, communication among the farmers became lost.

When the BRI Bank is interested in giving cattle credit to the farmers participated in the Project, they form a farmer group. This group meet every month to discuss the development of the credit cattle.

Table 4.3.1. Farmer reaction on the existence of "Kelompok Tani" (Farmer group)

Reaction	Types of farmers			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
1. Interest				
a) Large	65	53	100	67
b) Small	10	20	-	25
c) None	25	27	-	8
2. Beneficial				
a) Communal work	6	6	16	-
b) Subsidy	94	94	77	100
c) Marketing	-	-	7	-

Table 4.3.2. Farmer experience in getting cridit from the bank

Experience	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
Has received cridit	38	29	24	9
Never received cridit	62	48	76	91

Table 4.3.3. Farmer interest in getting credit from the bank

Interest	Typest of farmers			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
Large	77	70	81	64
Small	15	20	8	9
None	8	10	11	27

Table 4.3.4. Reason for selling the cattle

Farmer	When reaching 375 kg (%)	After beeing kept for 4 years (%)	Urgency (%)
Nuclei/core	35.71	-	64.29
Peripheral	30.77	-	69.23
Course	29.63	-	62.96
Follow-up	66.67	7.41	33.33
Bank	33.33	-	66.67
Average	39.22	1.48	59.30

4.3.2. Time to sell the cattle

It was found that 39.2% of the farmers sold their cattle when reaching 375 kg live weight (Table 4.3.4). This notion was not only held by the core farmers and the peripheral farmers, but also by the other

With regard to the reason of selling the cattle, 59.3% indicated the urgent need such as building or renovating the house (29.7%), school expenses (23.2%), ritual ceremony (20.2%) and paying credit for the Bank (11.4%) (Table 4.3.5).

Farmers also sell the young cattle (calf) to meet the market demand for "lawar" dishes. This "lawar" dishes consisting of the meat and hide/skin of the calf is very popular not only as food but also as dishes to supplement the cultural and religious activities. Therefore, from the social aspect, selling calf is alright since it could satisfy the demand for consumption and also for "Buta Yadnya" ritual and religious ceremonies. However, selling older cattle, may cause a wrong impression, for the society considered that such farmer is under a financial debt (except those stated in Table 4.3.5, which is one of the aims in keeping livestock in the farm).

In line with the development of the introvert to extrovert attitude in the society and the introduction of By-products (Bali) system, there is a shift in the farmer attitude regarding the time of selling the cattle from the traditional system to the standard live weight (375 kg) as practised by the By-products (Bali) (Table 4.3.6).

When the cattle sold, most farmers prefer to buy new cattle than awaiting the calf from the cow kept in the farm (Table 4.3.7). In the six years presence of By-products (Bali), it has sold the 375 kg cattle and bought the new (100 kg) cattle 3 times. This might induce to change the attitude of the farmers which previously prefer to wait the new calf to born than to buy weaned calf.

Table 4.3.5. Urgency factors causing the farmers have to sell the cattle

Farmer	Household (%)	Building (%)	Religi-ous cere-money (%)	Contri-bution (%)	School need (%)	Cridit (%)
Nuclei/core	-	31.03	17.24	17.24	20.69	13.79
Peripheral	-	36.00	20.00	12.00	20.00	12.00
Course	4.54	15.91	22.73	9.09	47.73	-
Follow-up	-	58.82	23.53	17.65	-	-
Bank	-	6.90	17.24	17.24	27.59	31.03
Average	0.91	29.73	20.15	14.64	23.20	11.36

Table 4.3.6. Farmer attitude on selling and replacing the cattle

Attitude	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
1. Time to sell				
a) Before reaching market (375 kg) weight	-	-	25	-
b) After reaching market weight	100	100	75	100
2. Time for replacement				
a) Very soon	80	89	100	75
b) Not in a hurry	20	11	-	25

Table 4.3.7. Farmer attitude on the mode of replacing the cattle

Typest of replacement	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
Buy new one	94	70	91	69
Wait for the new calf to born	6	30	9	31

Table 4.3.8. Farmer motivation in selling the cattle before the presence of By-products (Bali)

Motivation	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
1. Experience in selling :				
a) Yes	75	88	83	83
b) No	25	12	17	17
2. Animal sold :				
a) Older cattle	15	14	19	25
b) Heifer	10	14	19	8
c) Bull	75	72	72	68

The By-products (Bali) sell the experimental cattle when reaching 375 kg, since this is the minimum live weight the cattle can be sold or slaughtered (market weight for export). The core and peripheral farmers now all used to the idea, that the cattle is not to be sold when not yet reaching 375 kg. This idea discard the notion in the community that selling cattle after weaning is not more considered that the farmer has a financial problem, because at 375 kg live weight it is time to sell the cattle.

4.3.3. The importance of concentrate supplement

In the traditional small holder farming system, grasses is for the ruminant (e.g. cattle), whereas concentrate from the agro-industrial by-products (e.g. copra meal and rice bran) produced in the farm is for the non-ruminant (e.g. pigs). Therefore, feeding concentrate is not commonly practised to the ruminant raised traditionally.

The project By-products (Bali) has shown that concentrate supplement caused the cattle to grow faster, so that it reached market weight faster. Of the farmers monitored, about 97.8% have positive attitude toward the importance of concentrate supplement in inducing a faster growth of the cattle. Further more 50% of the respondent saying that the concentrate is not only good for pig and chicken, but is also good for the cattle.

With regard to the availability of the concentrate, 40 - 63% of the farmer monitored indicated that it was not too difficult to get the concentrate. This is in constrast to that what the farmer previously belived that with the size of the cattle, they could imagine a lot of concentrate will be consumed. However, when the farmer saw that the concentrate is only as a supplement and not as the whole diet, their attitude change.

With regard to the health hazard, most farmer previously belived that rice bran cause itching to the cattle, copra meal cause the cattle too fat so that is not good for "Balinese dishes"

and poultry manure cause the cattle sick. Such misconception has been changed by the By-products (Bali).

4.3.4. The importance of tree fodder

Most small holder farmers in Petang believe that grass is a good feed, whereas tree leaves are not as good as the grass. Therefore grass is for the cattle, since cattle is considered as first class animal, while tree leaves is for the goat, since goat is considered as second class animal. Only when grass is not easily available, such as during the dry season, farmers fed tree leaves to the cattle

Actually cutting shrub or tree leaves is much faster than cutting the grass, so that when mixing the grass and tree leaves will save some times than when feeding grass alone. However, there is a negative notion in the farmer community indicating that farmer feeding tree leaves to the cattle is lazy (not an industrious) farmers.

During the By-products (Bali) experiments, it has been shown that cattle fed grass supplemented with tree leaves gained weight 58% faster than those fed grass only. On the other hand, tree leaf supplemented cattle gained weight 40.6% less than the concentrate supplemented cattle. This demonstration showed to the farmers in Petang that tree leaves are not only good for goat but are also good for cattle.

4.3.5. Preference on the sex status of the cattle

In the traditional farming system, farmers generally prefer cow than bull/bullock, since according to the farmer perception cow has the advantages of producing calf, more docile so that easier to train for ploughing, produce more commulative fertilizer and can be sold any time. Further more some farmers believe that only certain farmers can look after male cattle without ill effect to the farms. With such perception, farmer tend to sell the male than the female cattle (Table 4.3.8). However, since the introduction of By-products (Bali), where steers were fattened to

bullock the farmer perception on the male cattle changes (Table 4.3.9).

Small holder farmers in Petang prefer to raise castrated cattle (steer) than non-castrated cattle (bull), because the steer is tamer and easier to handle than the bull, eventhough the price of the bull is 20 - 25% more expensive than the steer/ bullock both at the farm gate and at the cattle sale market.

The follow-up research of the By-products (Bali) has shown that when the steer and bull raised together, the bull did not show much more agresiveness than the steer. Further more, given the same amount and types of feed the bull gained 14% more weight than the steer. Farmers now know that a bull when raised together with a steer/bullock is not as dangerous as it is imagined by the community.

4.3.6. Source of information

More than 50% of the peripheral, follow-up and bank farmers indicated that the fattening informations are obtained from the other farmers (Table 4.3.10.). This would suggest that only some farmers actively asked thecompotent resources, while the majority of the other farmers getting the second hand information from the farmer asking the information.

For problem solving information, the farmers in general asked the other farmers (44.6%), the field extension officer (53.5%) and the project officer (1.9%) (Table 4.3.11). This indicates that only certain farmers communicate directly to the project officer, and they in turn, will spread the new idea to other farmers. The farmers chosen as a source of information were those considered successful in rearing the cattle. Of the 5 topics commonly asked (e.g. management, breeding and selection disease and feeds and feeding) feed and feeding was the most popolar topic (61.1%) (Table 4.3.12). This indicated that the farmers are interested in the new types of feeds and feeding system introduced by the By-products (Bali). 49.3 % of the farmer

Table 4.3.9. Farmer view in raising bull and bullock

View	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
In agreement/accept	95	100	91	92
Not in agreement/ refuse	5	-	9	8

Table 4.3.10. Information obtained regarding cattle fattening

Farmer	Source of information			
	By-products (Bali) (%)	Field extention officer (%)	Friend (%)	Course (%)
Nuclei/core	45.45	27.27	27.27	-
Peripheral	12.50	12.50	75.00	-
Course	9.68	29.03	3.23	58.06
Follow-up	37.50	-	62.50	-
Bank	7.69	33.33	55.56	-
Average	23.35	20.43	44.71	11.61

Table 4.3.11. Information obtained when the farmers facing certain certain problems

Farmer	Source of information		
	Field extension officer (%)	By-products (Bali) (%)	Friend (%)
Nuclei/core	36.84	100.00	63.16
Peripheral	37.50	6.25	56.25
Course	87.10	3.23	9.67
Follow-up	60.00	100.00	40.00
Bank	46.15	-	53.85
Average	53.52	1.90[1)]	44.58

Table 4.3.12. Parameters asked by the farmers to the other farmers

Farmers	Parameters beeing asked				
	Husbandry (%)	Breed selection (%)	Feed and feeding (%)	Stall (%)	Medication (%)
Nuclei/core	12.50	-	87.50	-	-
Peripheral	6.25	-	56.25	37.50	-
Course	16.67	16.67	16.67	33.33	16.67
Follow-up	16.67	-	83.33	-	-
Bank	-	-	61.54	38.46	-
Average	10.42	3.33	61.06	21.86	3.33

group meeting, were discussing the By-products (Bali) system (Table 4.3.13). It was started by the members of the group by the field extension officer, as well as by the head of the farmer group. This indicated that the By-products (Bali) system did not only catch the attention of the field extention officer, but also the farmers as well.

For the skill they acquired in feeds and feeding the cattle, 53.5% indicated that they from the fatherson experience, 14.3% from the By-products (Bali) 8.1% from the other farmers and only 1.4% from the field extension officer (Table 4.3.14).

The respondent farmers indicated that the skill they have gained dealing with cattle housing were mostly obtained from fatherson experience (74.8%) and to a small extend (14.6%) from the By-products (Bali) (Table 4.3.15).

The survey indicated that the core and peripheral farmers become source of information for the other farmers. The appointment of some of the core and peripheral farmers as head of farmer group, head of a social group and cattle credit by the Bank indicated that they are considered as responsive people in the community.

4.3.7. More convenience for village activity

Traditional farmers usually tethered the cattle in the morning and kept in the stall during the rest of the day. When tethered in the field it has to be moved to get feeds. When there is an activity in the village, the farmer has to sneak out to look after the cattle.

As part of the village community each farmer belongs to various social activity. The three most important and must be attended are the "desa", "banjar" and "sekehe" convention. This is particularly true for the married man, once the man get married he is automatically tied up with at least the 3 social activities mentioned above. Most farmers considered such activities are a bit burden, so that the custom of tethering the cattle becomes common practise when the farmer busy with the social activity.

Table 4.3.13. Discussion on cattle fattening during the farmer group meeting

Farmer	Discussion on fattening		Those starting the discussion		
	Discussion (%)	No discussion (%)	Members (%)	Head of the group (%)	Field extension officer (%)
Nuclei/core	61.90	38.10	30.77	38.46	30.77
Peripheral	43.75	56.25	28.57	28.57	42.86
Course	14.71	85.29	20.00	-	80.00
Follow-up	41.67	58.33	80.00	20.00	-
Bank	84.62	15.38	36.36	27.27	36.36
Average	49.33	50.67	39.14	22.86	38.00

Table 4.3.14. Source of information regarding feeds and feedings

Farmers	Source of information				
	Fatherson experience (%)	Friend (%)	Field extension officer (%)	By-products (Bali) (%)	Course (%)
Nuclei/core	94.44	5.56	-	-	-
Peripheral	35.00	35.00	-	30.00	-
Course	21.43	-	7.14	-	71.43
Follow-up	41.67	-	-	58.33	-
Bank	75.00	-	-	25.00	-
Average	53.51	8.11	1.43	22.66	14.29

Table 4.3.15. Source of information for building and maintaining cattle stall

Farmer	Father-son experience (%)	Field extension officer (%)	By-products (Bali) (%)	Course (%)
Nuclei/core	80.95	-	19.05	-
Peripheral	86.67	-	13.33	-
Course	46.67	23.33	-	30.00
Follow-up	75.00	-	25.00	-
Bank	84.62	-	15.38	-
Average	74.78	4.67	14.55	6.00

Table 4.3.16. Farmers burden in relation with raising cattle in confinement

Types of activity	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
1. Village custom				
a) Disturbed	33	40	22	9
b) Not disturbed	67	60	78	91
2. Banjar custom				
a) Disturbed	32	47	43	18
b) Not disturbed	68	53	58	82
3. Sekehe custom				
a) Disturbed	44	23	43	38
b) Not disturbed	56	77	57	62

In the project By-products (Bali), the cattle were kept in the stall all the time and feeding is carried out twice a day. Such a system did not much intervere the social activity in the village (Table 4.3.16). Besides, replacing 30% of the grass with concentrate, reduced the time spent in cutting the grass, so that the farmers actually have more spare time than before.

4.3.8. In favour of the change in the farming system

In Petang district, since 1983 many dryland farmers are changing from growing cash crop to growing vanilla and clove in their field. Before this shift, plenty grass are available during the off-cash crop season. Farmers are free to tether their cattle on the land temporarily not used for cash crop production. The farmer owning the land lodged no complaint, even they were pleased because their land received free fertilizer from the cattle manure. However, when farmers plant vanilla and clove, no more land is available for free grazing and tetherings. Furthermore farmers complaint that such shift from cash crop to plantation crop, reduce the availability of the grass. However such complaint does not last long, since the By-products (Bali) has showed that 30% of the grass can be replaced with concentrate, Furthermore, By-products (Bali) has showed that inclusion of 20% tree leaves could increase cattle growth. Farmers were quite responsive to this idea.

Before the introduction of the plantation crop the shrub and tree leaves sources were those fruit trees used as wind breaks and fence around the field. With the introduction of vanilla, the Erthrina, Gliricidia and Leucaena used as climber to the vanilla, are lopped every 6 months to prevent shading. Such residue is for cattle feeding. Therefore the tree leaf supplementation verified by the By-products (Bali) is supporting the change.

Before the plantation crop introduction, farmers kept only 2 - 3 cattle with the main aims to plough the land. With the introduction of plantation crop, farmers keep cattle for producing manure for the plantation crop.

Table 3.3.17. Farmer intention to spend the bank cridit

Mode of spending	Types of farmer			
	Nucleus (%)	Peripheral (%)	Course (%)	Follow-up (%)
All for the cattle	75	100	75	100
Half for the cattle	25	-	25	-

To get more manure farmer kept more cattle. By-products (Bali) has shown that a farm family can keep up to 5 cattle without much interference with their activity.

In line with the above-mentioned shift in the farming pattern and farmer attitude, farmer considered that credit from the Bank can be used for increasing the activity in the farm (Table 4.3.17). Farmer no more considered that getting credit from bank is a big risk, since they have cattle and plantation crop to back-up the payment.

4.4. Subsequent Carreers the Team Members

4.4.1. The staff member

The academic staff, technician and administrative officer, either getting new post or getting extra responsibility.

The project leader is appointed as head of the Board of editors of Udayana University research journal and Head of foreign relation of Udayana University (UNUD) (Table 4.4.1). The research assistant is appointed as head of the Department of Nutrition and Tropical Forage Science, UNUD. The two analyst are appointed as junior lecturers in the Faculty of Animal Husbandry, UNUD and the tabulator is appointed as graduate assistant in the Project Three Strata Forage (Indonesia).

One technician is appointed as administrative head of the Biro of extension and development, UNUD. The two field technician are appointed as field technian in the Project Three Strata Forage (Indonesia). The Foreman is appointed as head of dryland farmer group in Petang district.

The Bursar is appointed as administrative head of the Veterinary science study program. The typest is appointed as head of Biro of education in the Faculty of Technology, UNUD.

Table 4.4.1. Subsequent carreers of the staff member

No.	N a m e	Position during the project (1978-1984)	Present position	Remark (appoinment in the present position
	Lecturers			
1.	I.M. Nitis	Project leader	1. Project leader "Three Strata Forage (Indonesia)	Appointed 1 July 1984
			2. Head, board of editor of Udayana University research Journal.	Appointed 1 December 1983
2.	K. Lana	Research assistant	1. Head of the Dept. of Nutrition and Tropical Forage Science	Appointed 1 May 1983
			2. Research Assistent "Three Strata Forage (Indonesia)"	Appointed 1 July 1984
3.	C.G.O. Susila	Analyst	Yunior lecturer in the Faculty of Animal Husbandry, UNUD.	Appointed 1982
4.	C. Istri Putri	Analyst	Yunior lecturer in the Faculty of Animal Husbandry, UNUD.	Appointed 1982
5.	Sentana Putra	Tabulator	Graduate assistant "Three Strata Forage (Indonesia)"	Appointed, 1 July 1985

Table 4.4.1. (Continued)

No.	N a m e	Position during the project (1978-1984)	Present position	Remark (appointment in the present position
	Technician			
6.	K. Tegig Kusumah	Technician	Administrative head of the Biro of Extension and development, UNUD.	Appointed, 1 February 1985
7.	M. Tinggar	Field technician	Field technician, Three Strata Forage (Indonesia)	1 July 1984
8.	W. Ngenteg	Field technician	Field technician, Three Strata Forage (Indonesia)	1 July 1984
9.	W. Suastama	Foreman	Head dryland farmer group	The Farmer group estatablished in June 1984.
	Administration			
10.	N. Sarma	Bursar	Administrative head, Veterinary Science Study Program, UNUD.	Appointed, 1 March 1984
11.	M. Astri	Typest	Head Biro of Education, Faculty of Technology, UNUD.	Appointed, 1 March 1982
12.	N. Seriasih	Typest (to replace no.11)	1. Typest for the Laboratory of Animal Nutrition 2. Typest for the project Three Strata Forage (Indonesia)	Appointed, March 1980

4.4.2. The student

Of the 15 students participated in the By-products (Bali), after graduated they are working in deverse field (Table 4.4.2). Four as lecturers in the Faculty of Animal Husbandry in the Gover-nement and Private Universities, 3 in the Department of Land Reclamation, 2 in the Feed milling factory, 2 in Private Firm selling drug for livestock, one in the Dept. of Transmigration, one in the Department of information, one in the Bank and one on the Biro of Planning and Development.

It appear that their respective new positition, directly and indirectly is related with cattle in particular and livestock in general.

4.4.3. The farmer

After complition of the By-products (Bali), only 64 - 67% of the farmers are still working full time in the farms, while the others are taking sideline job as casual labour, driver, farm-implement handycraft, retailer and leader of certain group activity in the village (Table 4.4.3).

More follow-up research farmers become certain group leader in the village is expected, since those follow-up research farmers are selected from the core and peripheral farmers.

The course farmers during the course of fattening Bali cattle consisted of 50% pure farmers, 12% doing sideline job as head of certain group in the village, 18 % doing sideline job as retailer, 6% doing sideline job as tailor and the other 14% doing other sideline job such as rice huller and public servant. Two years after the course, their profession did not change.

4.5. Constraints in the Implementation of the Research Output and Acquired Skill

Based on the motivation, perception and metal attitude of the farmers, the following constraints are anticipated by the farmers.

Table 4.4.2. Subsequent carreers of the participating students

No.	N a m e	Participation during the Project life (1978 - 1984)	Title of the research[1)]	Present position
1.	I.M. Yasa Adnyana	Research students[3)]	Digestibility of grass and grass + concentrate mixture for cattle (1982)[2)]	Reboisation staff
2.	I.D.M. Ngurah	Research student	Chemical composition of the natural grass in Bali (1982)	Reboisation staff
3.	I.G.P. Nuriatha.	Research student	Chemical composition of the tree leaves in Bali (1982)	Bureau of planning, Bali Province
4.	I.D.A.N.Krisnawati	Research student	Effect of land classification on the chemical composition of some tree leaves during the wet season in Bali (1983)	Junior lecturer Faculty of Animal Husbandry, University of Saraswati, Denpasar
5.	A. Farida	Research student	Chemical composition of some tree leaves during the dry season in Bali	Junior lecturer Faculty of Animal Husbandry, Nusa Cendana University Kupang.

Table 4.4.2. (Continued)

No.	N a m e	Participation during the Project life (1978 - 1984)	Title of the research1)	Present position
6.	I.G.B. Yogiswara	Research student	Chemical composition of the nonocot and dicotylidon leaves during the dry season in Bali (1983).	Chemist and drug Store Department
7.	K. Suaraningsih	Research student	Roughage supply and requirement in Bali (1983)	Life insurance Dept.
8.	A.A. Suamba	Research student	Effect of shading on the yield and chemical composition of natural grasses in Bali (1983)	Department of Information, Buleleng
9.	I.K. Ramia	Research student	Effect of concentrate supplement on the feeding behaviour of Bali cattle under confinement (1980)	Junior lecturer FAPET, Udayana University, Denpasar
10.	I.M. Mandia	Research student	Effect of concentrate supplement on the performance of Bali steer (1982)	Land Utilization,Dept. Jakarta.
11.	M.A. Rasna	Research student	Effect of replacing 30% of the roughage with concentrate on the growth of Bali cattle (1982).	Rice Huller Factory,

Table 4.4.2. (Continued)

No.	N a m e	Participation during the Project life (1978 - 1984)	Title of the research[1)]	Present position
12.	I.W. Sukanten	Research student	Effect of concentrate supplement on the life weight and body dimension correlation of Bali cattle (1982)	Junior staff, FAPET, Udayana University Denpasar
13.	I.K.A. Suyatna	Research student	Effect of replacing 30% of the roughage with concentrate on the correlation between live weight and body dimension of Bali cattle (1982)	Department of Transmigration, Kalimantan
14.	C.H. Indrakusumah	Research student	Effect of concentrate supplementation on the body composition of Bali cattle (1983)	Animal feed Factory, Surabaya
15.	I.M. Dirgayusa	Research student	Economic benefit of concentrate supplement in fattening Bali cattle (1982	People Bank, Jakarta

1) In Indonesian language, 2) Year graduated, 3) Research under supervision leading to "IR" degree.

Table 4.4.3. Subsequent carreer of the farmers

No.	Name	Position during the project time (1978-1985)	Present position (%)					
			Farmer	Farmer (labour)[1]	Farmer (driver)	Farmer (handicraft)	Farmer (village leader)	Farmer (retailer)
1.	Core/nuclei farmer	Farmer	66	14	10	5	5	-
2.	Peripheral parmer	Farmer	64	18	6	-	6	6
3.	Follow-up research farmer	Farmer	67	17	-	8	8	-

1) In parenthesis ( ) is the side line job.

4.5.1. Capital

34.8% of the respondents indicating that concentrate supplement could increase the cattle growth (Table 4.5.1). However, they did not follow the system fully since some farmer claimed that they have no money to buy the concentrate (43.8%), or some farmers said (6.9%) difficult to get the concentrate (Table 4.5.2).

With present traditional farming system, the agro-industrial by-productsfeeds (e.g. rice bran and copra meal) produced in the farm are only enough for the pigs. Eventhough the farmers now know that such feeds are also good for cattle, they have no extra cash to buy such feeds. This constraint can be overcome by including the feed cost in the cridit package deal.

4.5.2. Availability of the agro-industrial by-products

Although 50% of the respondent have attitude which do not forbid poultry manure as cattle feed; they did not follow the system, since most of them did not have continous supply of poultry manure (Table 4.5.3).

Only 37.5% of the respondent have continous supply of rice bran and only 14.9% have continous supply of copra meal. Such supply at present are mainly for pigs.

When the project started, many farmers raising commercial bird in their backyard as a side line activity. Since the price of the eggs go down and the price of the commercial feeds go up, most farmers quit such side line activity. The number of local fowl also deminishing, since such fowl can not any more scavenging in the farm. This is due to changing in the farming pattern from cash crop to vanila production. It is claimed that the scavenging fowl scrathing the root of the vanila vein causing the death of the plant.

Two years ago a small scale coconut drying plant to make copra is build in Petang. Farmers prefer to sell their coconut to this unit than to process the coconut to make coconut oil. Therefore, availability of the locally produced coconut oil meal become less,

Table 4.5.1. Positive perception toward cattle fattening

Farmer	Grew faster (%)	Reach market weight faster (%)	Better meat quality (%)	More manure production (%)
Nuclei/core	90.00	10	-	-
Peripheral	100.00	-	-	-
Course	72.41	17.24	3.45	6.90
Follow-up	88.89	-	11.11	-
Bank	72.73	18.18	-	9.09
Average	84.81	9.08	2.91	3.20

Table 4.5.2. Negative perception toward the cattle fattening

Farmer	No capital (%)	High feed cost (%)	No concentrate (%)	Can not used as work (%)	Can not fed as prescribed (%)
Nuclei/core	20.00	60.00	6.67	13.33	-
Peripheral	70.00	10.00	10.00	10.00	-
Course	27.27	36.36	18.00	9.09	9.09
Follow-up	37.50	62.50	-	-	-
Bank	50.00	50.00	-	-	-
Average	40.95	43.77	6.97	6.48	1.82

Table 4.5.3. Continous supply of concentrate (rice bran, copra meal, poultry manure) in the farm

Farmer	Rice bran		Copra meal		Poultry manure	
	Yes	No	Yes	No	Yes	No
Nuclei/core	42.86	57.14	19.05	71.43	-	100
Peripheral	43.75	56.25	6.25	81.25	-	100
Course	38.24	61.76	17.65	64.70	17.65	82.35
Follow-up	16.67	83.33	8.33	91.67	-	100
B a n k	46.15	53.85	23.08	53.84	-	100
Average	37.53	62.47	14.87	72.58	3.53	96.47

since the farmer only produce coconut oil for their own use and not for selling purposes.

In the case of rice bran, there are about 5 rice milling factories are built in Petang districts in the past 3 years. None of the farmers now process their rice grain traditionally. Instead, the farmers sent their rice grain to the rice milling factory. Only some of the rice bran produced are kept for the pigs and the rest are sold to the factory. Therefore, not much rice bran is available in the farm house, but plenty are available in the rice milling factory. Once in the factory the farmers can not buy it in a small quantity.

All this constraints can be overcome by forming a farmer group.

4.5.3. Cattle feeding schedule

The By-products (Bali) has introduced morning and avening feeding frequency to the cattle. Some farmers, particularly the rice farmers found out that such system interfere with their activity particularly during the time of tilting the land and planting the rice. On the otherhand, the plantation farmers considered such system is more convenience, since it is not interfere with their daily farming activities.

Such constraints have been overcome by involving members of the family to take care of feeding the cattle.

V. DISCUSSION

The research project By-products (Bali) whuch was carried from 1978 to 1985, has studied the importance of some agro-industrial by-product supplements to roughage basal diet on the performance of Bali cattle. This research is in line with the livestock development plan of Bali province, in which Bali cattle is projected to supply more beef meat to the hotel in Bali, more cattle to be sent interisland and exported. The location of By-products (Bali) at Petang is in line with

the master plan of the Bali province in which middle part of Bali streching from west to east is destined for livestock and vegetable belt.

Because of those prospects, the head of Badung regency has participated in the Project by renting 5 Ha land to grow elephant grass as a feed reserve for the dry season. In 1981 the Governor of Bali and staffs had visited the Project and had a discussion with the core and peripheral farmers. Since than, whenever the Governor made a visit to various villages in Bali, the Governor telling the farmer that concentrate should be given to the cattle so that the cattle grow faster. The local newspaper and local TV also piblizesing the project by writting articles and showing film and news on many accassion. Many farmers become interested and visited the Project. The Department of Animal Husbandry Bali province has tried the concept of roughage : concentrate ratio for veal and vealer production (Anon 1981, 1982). The Bank showing interest to give cattle cridit to the farmer participated in the Project. An economic evaluation was carried out and a short course on fattening Bali cattle has been conducted to interested farmers to anticipate with the Bank request. On the Governor request, the meat of the By-products (Bali) cattle has been tested for its suitability to meet the international hotel standard.

The By-products (Bali) has made some contribution to science through Ph.D. disertation and "Sarjana" (M.Sc.) thesis on the aspect of roughage and concentrate feeds and feeding to cattle. Citation of the result of By-products (Bali) by some authors in the country and overseas and by the policy makers regionally and nationally, and the implementation of the research results by some Government and private institutions indicating that the By-products (Bali) has some scientific and practical applications

The use of copra meal, rice bran, poultry manure and tree fodder in cattle feeding, the sale of cattle at 375 kg live weight, raising bullock and steer in pairs, feeding frequency twice instead of once a day, may have changed the attitude some of the farmers, in which formerly such managements may have cause some social disadvantages. The appointment of some of the core and peripheral farmers as head of certain farmer group indicating that the technology introduced by the By-products

(Bali) did not cause any social conflict. rather it is showing evidence of social benefit.

The By-products (Bali) has shown that the carrying capacity of the land can be increased, the cattle turn over is faster, increase quality of the manure and more efficient utilization of the feed -resources. These qualitative economic benefit will apparent more to the dryland farmers than the rice farmers. However in the past 3 yeards, there is a shift in farming practice from cash crop production to plantation crop production. The evidence of economic benefit shown by the By-products (Bali) will be more in favour to this plantation crop farming system.

Eventhough technically and econonically the By-products (Bali) is feasible, participation of the farmers to implement the result and the skill is not as expected. The main reason is beacuse most of the farmers have not enough cash to buy cattle and concentrate. For this reason the Government should play more role by : a) Giving credit to the selected farmers b) including cost of the concentrate in the credit package deal c) distribution of the concentrate through farmer group organization rather than individual farmer and d) continous guidance and supervision by the field extention officer.

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ANNEX 1

The following information is summary of the questionair asked to the farmers, policy makers and end-users. The questionair is either in the form of check point or statement. Each respective farmer was asked the respective farmer's questionair plus the extension, the socio anthropology and the economic questionairs.

I.CORE/NUCLEUS AND PERIPHERAL FARMERS
(Actual format 2 pages questionqir)

1. Side line job
2. Livestock kept
3. Land ownership
4. Land utilization
5. Cattle care
6. Cattle feeds and feeding
7. Concentrate supplement
8. Performance of the cattle
9. Profitability
10. Follow-up of the result.

II. COURSE FARMER
(Actual format 3 pages questionair)

1. Occupation
2. Livestock kept before and after the course
3. Land ownership before and after the course
4. Livestock husbandry after the course
5. Implication of the concentrate feeding before and after the course
6. Livestock performance before and after the course
7. Profitability before and after the course

*)

8. The need of media communication
9. Types of communication
10. Frequency of communication

II. VISITOR FARMER

(Actual format 3 pages questionair)

1. Occupation
2. Land ownership
3. Livestock owned
4. Source of information regarding By-products (Bali)
5. Objectives of visiting By-products (Bali)
6. Impression after the visit
7. Follow-up after the visit
8. System being implemented
9. Types of concentrate used
10. Respond of the cattle
11. Profitability
12. Further implementation

IV. EXTENSION

(Actual format 10 pages questionair)

4.1. Motivation

1. The main objective of raising the cattle
2. The side-line objective of raising the cattle

4.2. Skillfulness

1. Number of cattle raised
2. The use of cattle for ploughing
3. Quality and types of feeds
4. Information regarding the feeds
5. Condition of the cattle stall

6. Cattle drug and vaccine
7. Time spent in looking after the cattle
8. Ability to pay the cridit

4.3. Perception

1. Prospect for keeping cattle traditionally
2. Project for "Kereman" cattle
3. Prospect for "By-products (Bali)" cattle
4. Which one of the 1, 2 and 3 is the best
5. Which one is carried out at present

4.4. Feed Supply

1. Availability of the roughage feed
2. Availability of the concentrate
3. Commercial poultry keeping

4.5. Mental Attitude

1. Growth of cattle under traditional method vs. concentrate supplemented method
2. Ease of keeping traditional vs. concentrate
3. Growth of work cattle vs. non-work cattle
4. Concentrate for cattle vs. non-ruminant
5. Poultry manure for cattle feeds
6. More capital for concentrate-fed cattle vs. traditional cattle
7. Cridit from Bank for concentrate and for more cattle.

V. SOCIO-ANTHROPOLOGY

(Actual format 8 pages questionair)

1. The status of the farmers
2. Implementation of the new system
3. Involvement in the cridit
4. Typest of livestock kept
5. Participation of the family in livestock keeping

6. Complaint in cattle fattening
7. Involvement in the "Subak" (water irrigation) system
8. Involvement in the village activity
9. Involvement in the "sekehe" (small village group)
10. Involvement in the farmer group
11. Attitude when the cattle sick or no feed available
12. Attitude when selling the cattle
13. The spending of the money from selling the cattle
14. The "tabu" (bad luck) attitude of raising cattle and other livestock
15. The attitude for steer and bullock

VI. ECONOMICS

(Actual format 8 pages questionair)

6.1. Family Structure and Employment

1. Family relation
2. Age
3. Education
4. Employment
5. Income

6.2. Land holdings

1. Types of land utilization
2. Types of land holdings
3. Location of the land

6.3. Belongings

1. Agricultural implement
2. Livestock implement
3. Hardware (household)
4. Belonging generated from the sale of livestock
5. Types of livestocks
6. Other belongings.

6.4. Workforce in Livestock

1. Types of work
2. Types of workforce
3. Number of workforce
4. Working time
5. Salary.

6.5. Productivity of the land

1. Types of produce
2. Quantity
3. Price

6.6. Productivity of the livestock

1. Types of livestock
2. Quantity
3. Price

6.7. Farm Utensils

1. Types of utensil
2. Quantity used
3. Cost
4. Source of money

6.8. Capital

1. Bank/cridit
2. Personel
3. Others

6.9. Interest

1. Bank
2. Private

6.10. Constraints

1. Cridit
2. Deposit
3. Administration
4. Breeds.

VII. POLICY MAKERS

(Actual format 2 pages questionair)

1. Source of information regarding By-products (Bali)
2. Actual visit to the By-products (Bali)
3. Reaction to the existence of By-products (Bali)
4. The use of By-products (Bali) in the planning and policy making
5. Active participation in supporting the By-products

VIII. POLICY EXSECUTERS/END-USERS

(Actual format 4 pages questionair)

1. Source of information regarding By-products (Bali)
2. Actual visit to the By-products (Bali)
3. Impression on the By-products (Bali)
4. Spreading the By-products (Bali) to farmers and field extension officer
5. Using the By-products (Bali) concept
6. Other concept than By-products (Bali)
7. Farmer consultation/inquiry on By-products (Bali)
8. Suggestion and comments.

IX. BANK

(Actual format 5 pages questionair)

1. Kind of cridit given to farmer in Petang disdrict before the By-products (Bali)
2. Kind of deposit required
3. Percentage not paying the cridit
4. Sunction
5. Source of information regarding By-products (Bali)
6. Direct visit to By-products (Bali)
7. Reaction to the By-products (Bali)

8. Information to cridit farmer on By-products (Bali)
9. Course on cattle cridit
10. Kind of farmer given cridit
11. Criteria for the course farmer getting the cridit
12. Farmer complain on the cridit system
13. Profitability when the By-products (Bali) is implemented
14. Other concept than By-products (Bali) for cridit allocation
15. Comment and suggestion.